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water pollution control plant



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ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

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ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

Members of the Local Advisory Committee,
City of Brantford.

Gentlemen:

We are happy to present you with the 1967 Operating Summary for the
Brantford Water Pollution Control Plant, OWRC Project No. 2-0011-58.

Your co-operation with our staff throughout the year has been appreciated.
Only with such co-operation can the war against water pollution be waged
effectively.

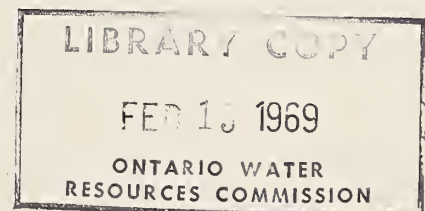
Yours very truly,

A handwritten signature in dark ink, appearing to read "D. S. Caverly".

D. S. Caverly,
General Manager.



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W. S. MACDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to submit to you the 1967 Operating Summary for the Brantford Water Pollution Control Plant, OWRC Project No. 2-0011-58.

The summary reviews progress during the year, outlines operating problems encountered and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

A handwritten signature in dark ink, reading "D. A. McTavish".

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.



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FOREWORD

● This operating summary has been prepared in order to acquaint readers with the management of the project during 1967. The efficiency of the plant's operation is reflected in a general review. Significant financial details are recorded, and technical performance is illustrated by graphs and charts.

The summary should answer two salient questions. Are the project's facilities adequate at this time? And can the project meet future requirements?

The Regional Operations Engineer is primarily responsible for the preparation of the report, and will be pleased to answer any questions regarding it.

Most of the material for the graphs and charts was compiled by the statistics section of the Division of Plant Operations, with the final versions of the graphs being drawn by the draughting section of the Division of Sanitary Engineering. Cost data were provided by the Division of Finance.

It will be evident from the report that all of these groups co-operated with substantial success.

C O N T E N T S

Foreword	1
Title Page	3
'67 Review	5
Project Costs	6
Operating Costs	7
Process Data	10
Conclusions	Inside back cover

BRANTFORD
water pollution control plant

operated for

THE CITY OF BRANTFORD

by

THE ONTARIO WATER RESOURCES COMMISSION

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Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: R. S. McKittrick

801 Bay Street Toronto 5

'67 REVIEW

The total 1967 operating costs for the Brantford Water Pollution Control Plant were \$226,643.20 or \$86.44 per million gallons treated. The increase in operating costs over 1966 was 20 percent. In addition to normal increases in salaries, chemicals and power, the project was assessed at \$22,773.85 in municipal taxes (taxes were not paid in previous years of operation) and this basically accounted for the large increase over the 1966 costs.

A total of 2621.781 million gallons of raw sewage was treated in 1967 representing an increase of 5.3 percent over 1966. There was a 38 percent increase in total organic removal in 1967 and the plant effluent showed an overall improvement of 36 percent in BOD removal and 22 percent in suspended solids removal.

Proctor & Redfern, consulting engineers, were hired during the year to prepare a report on modifications to the aeration equipment. The report is expected in 1968.

There was an increase of 20 percent in the quantity of raw sludge pumped to the primary digesters and again sludge handling was hindered by the lack of supernatant from the secondary digesters.

David Moses and Tom Hird were added to the operating staff bringing the complement of operators to five and the total plant staff to twenty men.

The equipment maintenance program was considerably improved in 1967 and the preventive maintenance program is gaining momentum as staff experience increases. Masonry deterioration on the digesters was the subject of considerable investigation and a course of action for renovation will be recommended in 1968.

It was becoming increasingly difficult to find adequate space in the sludge disposal area directly behind the plant, and some clearing was done in 1967 as a temporary measure. It is hoped arrangements can be made in 1968 to transfer some of the completely dried material to the sanitary land fill for use as cover.

PROJECT COSTS

NET CAPITAL COST (Estimated)	\$2,250,950.02
DEDUCT - Payments from Municipalities	<u>493,126.02</u>
Long Term Debt to OWRC	<u>\$1,757,824.00</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1967	\$ <u>394,208.90</u>
Debt Retirement	\$ 46,653.00
Reserve	11,127.31
Interest Charged	99,129.73
Net Operating	<u>226,643.20</u>
TOTAL	\$ <u>383,553.24</u>

RESERVE ACCOUNT

Balance at January 1, 1967	\$ 70,575.86
Deposited by Municipality	11,127.31
Interest Earned	<u>4,122.93</u>
	\$ 85,826.10
Less Expenditures	<u>(6,263.94)</u>
Balance at December 31, 1967	\$ <u>79,562.16</u>

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY	WATER
JAN	11,245.66	8307.04		93.60		1864.31	138.83		762.71	59.17	
FEB	11,618.87	8096.57			2034.32	487.92	191.05	321.30	378.37	109.34	
MARCH	19,831.62	13460.91			2001.70	1463.76	404.60	66.00	564.77	1610.10	259.78
APRIL	37,892.68	9194.21			2151.18	2603.18	584.32	1.60	147.74	23210.45	
MAY	16,762.46	9112.34		120.60	2001.92	3646.53	347.89		709.64	462.60	360.94
JUNE	18,901.17	8936.29	419.30		2226.80	4000.69	712.78	211.33	1768.30	625.68	
JULY	18,640.93	8925.99	870.24		2120.60	3419.08	305.11		1828.59	780.84	390.40
AUG	14,567.13	8927.42	524.41		2069.60	1835.94	652.66		130.60	426.50	
SEPT	20,400.46	13226.17	819.46		2042.60	1951.68	537.20		952.74	503.25	367.36
OCT	16,049.12	8994.13	379.31		2218.40	3222.71	376.06		416.68	441.83	
NOV	18,209.51	8629.48	348.19		2134.40	1257.24	240.70		2344.01	2532.77	722.72
DEC	22,523.59	8986.52		616.00	2247.80	5933.56	593.11	1526.00	721.39	1899.21	
TOTAL	226,643.20	114797.07	3360.91	830.20	23249.32	31686.60	5084.31	2126.23	10745.54	32661.74	2101.28

* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE \$4141.66

BRACKETS INDICATE CREDIT

YEARLY OPERATING COSTS

YEAR	M. G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1961	2287	\$155,644.80	\$68.00	4 CENTS
1962	2082	\$161,031.47	\$77.00	4 CENTS
1963	2040	\$175,173.29	\$85.87	7 CENTS
1964	2221	\$171,859.76	\$77.39	6 CENTS
1965	2395	\$185,704.83	\$77.53	6 CENTS
1966	2490	\$188,867.51	\$75.83	4 CENTS
1967	2622	\$226,643.20	\$86.44	4 CENTS

VACUUM FILTER COSTS (MONTHLY)

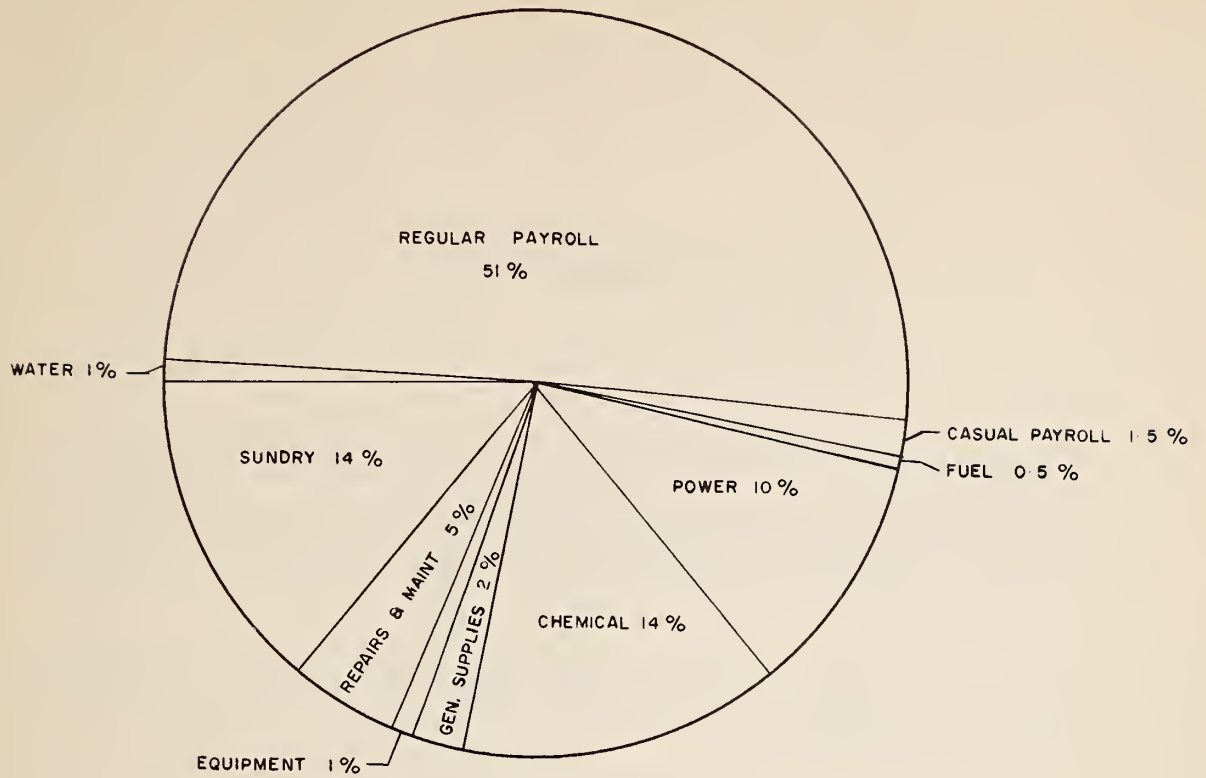
MONTH	COST PER MONTH					TOTAL	COST PER TON DRY WEIGHT					TOTAL
	FeCl ₃	CaO	LABOUR	ELEC	MAINT		FeCl ₃	CaO	LABOUR	ELEC	MAINT	
JANUARY	371.68	769.00	840.62	199.06	206.86	2387.22	2.61	5.41	5.91	1.40	1.45	16.78
FEBRUARY	427.50	882.21	945.69	212.75	232.72	2700.87	2.81	5.81	6.22	1.40	1.53	17.77
MARCH	591.76	1350.35	1350.99	333.51	332.46	3959.07	2.48	5.67	5.67	1.40	1.40	16.62
APRIL	509.53	1158.08	1170.86	344.63	288.13	3471.23	2.07	4.70	4.76	1.40	1.17	14.10
MAY	753.35	1408.39	1396.02	495.00	343.54	4396.30	2.13	3.98	3.95	1.40	0.97	12.43
JUNE	569.35	1170.06	1095.80	332.92	269.66	3437.79	2.39	4.92	4.61	1.40	1.13	14.45
JULY	612.04	1219.22	1185.87	334.83	291.83	3643.79	2.56	5.10	4.96	1.40	1.22	15.24
AUGUST	639.64	1324.85	1305.96	364.24	321.38	3956.07	2.46	5.09	5.02	1.40	1.24	15.21
SEPTEMBER	525.02	1368.85	1140.84	288.04	280.74	3603.49	2.55	6.65	5.54	1.40	1.36	17.50
OCTOBER	520.48	1242.97	1335.98	327.32	328.77	3755.52	2.23	5.32	5.71	1.40	1.41	16.07
NOVEMBER	461.27	1283.85	1576.15	363.17	387.87	4072.25	1.78	4.95	6.08	1.40	1.50	15.71
DECEMBER	423.93	1364.57	1666.22	394.35	410.04	4249.11	1.50	4.81	5.92	1.40	1.46	15.09
TOTAL	6405.49	14532.40	15011.00	3989.82	3694.00	43632.71						
AVERAGE PER MONTH	533.79	1211.03	1250.92	332.48	307.83	3636.06	2.30	5.20	5.36	1.40	1.32	15.58

COMMENTS

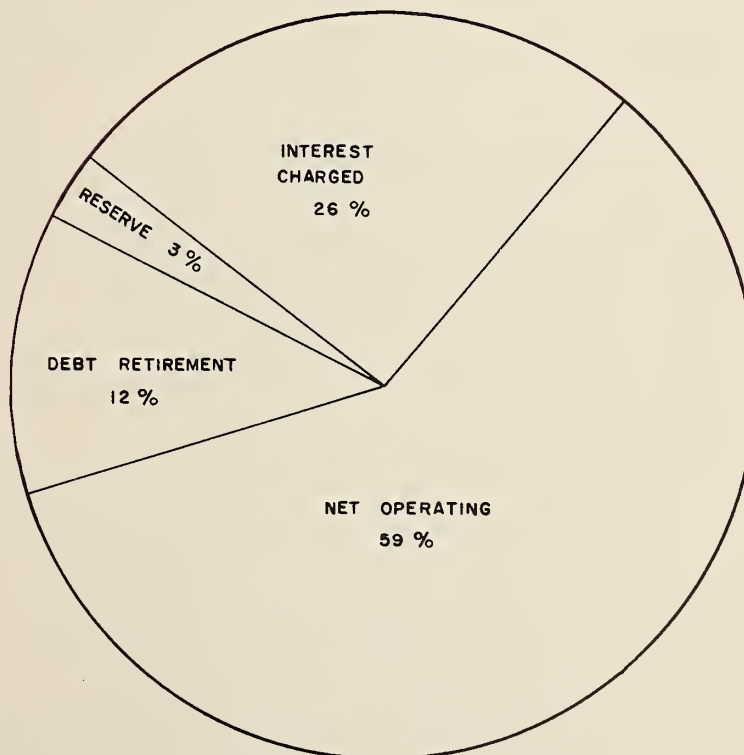
The costs as recorded in the above table are considered to be the most reliable estimate available on the vacuum filter operation in Brantford. Chemical, labour and maintenance costs are based on labour and material records for the year. The one cost still estimated is for power usage.

The cost per ton of dry solids filtered in 1967 was \$15.58 as opposed to \$16.75 per ton in 1966.

1967 OPERATING COSTS



TOTAL ANNUAL COST

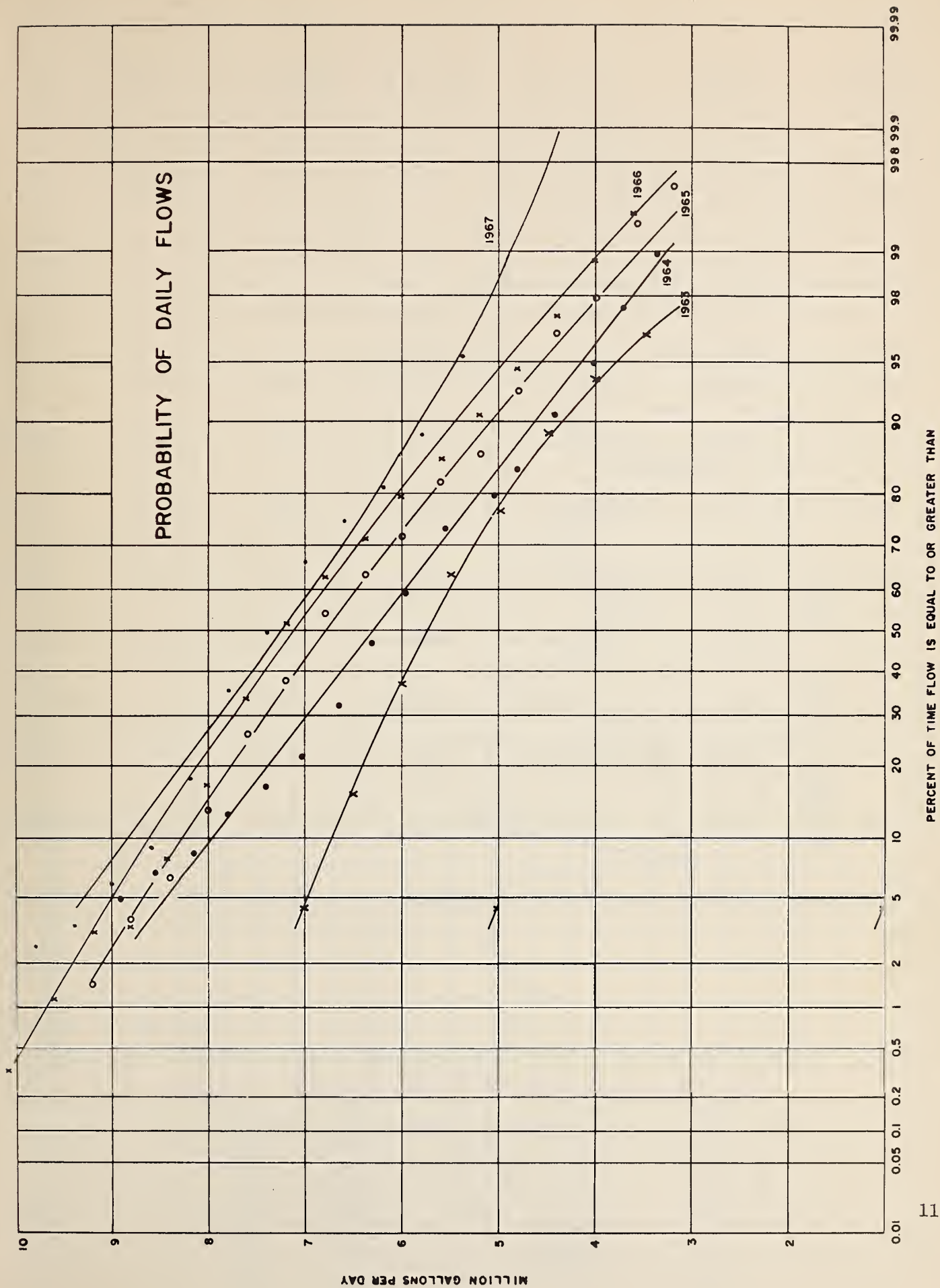


Process Data

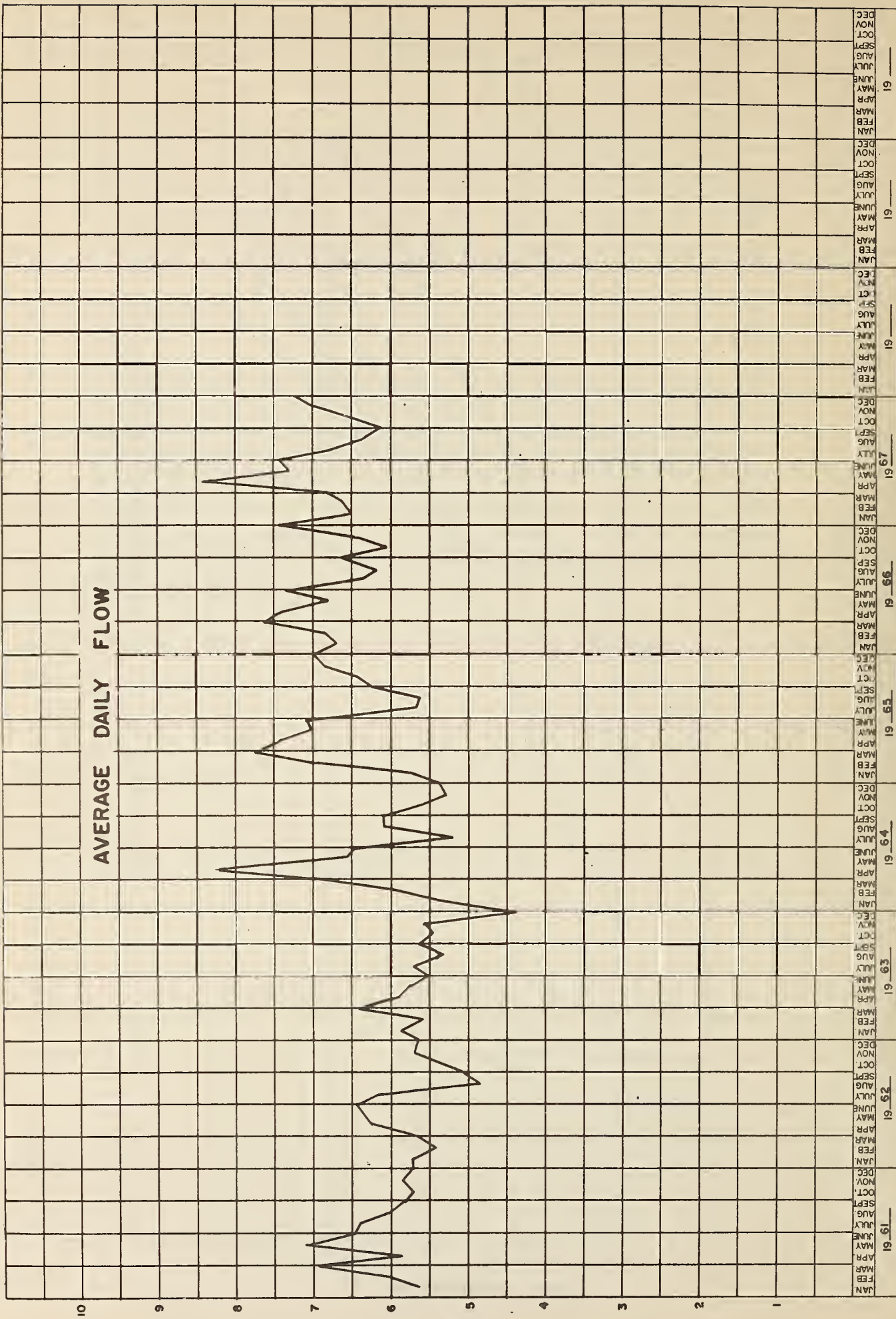
Flow

A total of 2621.781 million gallons of raw sewage was treated at the Brantford Plant in 1967. This represents an increase of 5.3 percent over the 1966 total flow. The average daily flow for the year was 7.18 mg. The maximum total flow for one month of 252.852 mg or an average daily flow of 8.43 mg occurred in April, as did the maximum daily flow for the year of 10.94 mg.

The two flow graphs and one flow chart provide a complete summary of flows at the Brantford plant in 1967 along with a comparison of flows from previous years.



AVERAGE DAILY FLOW

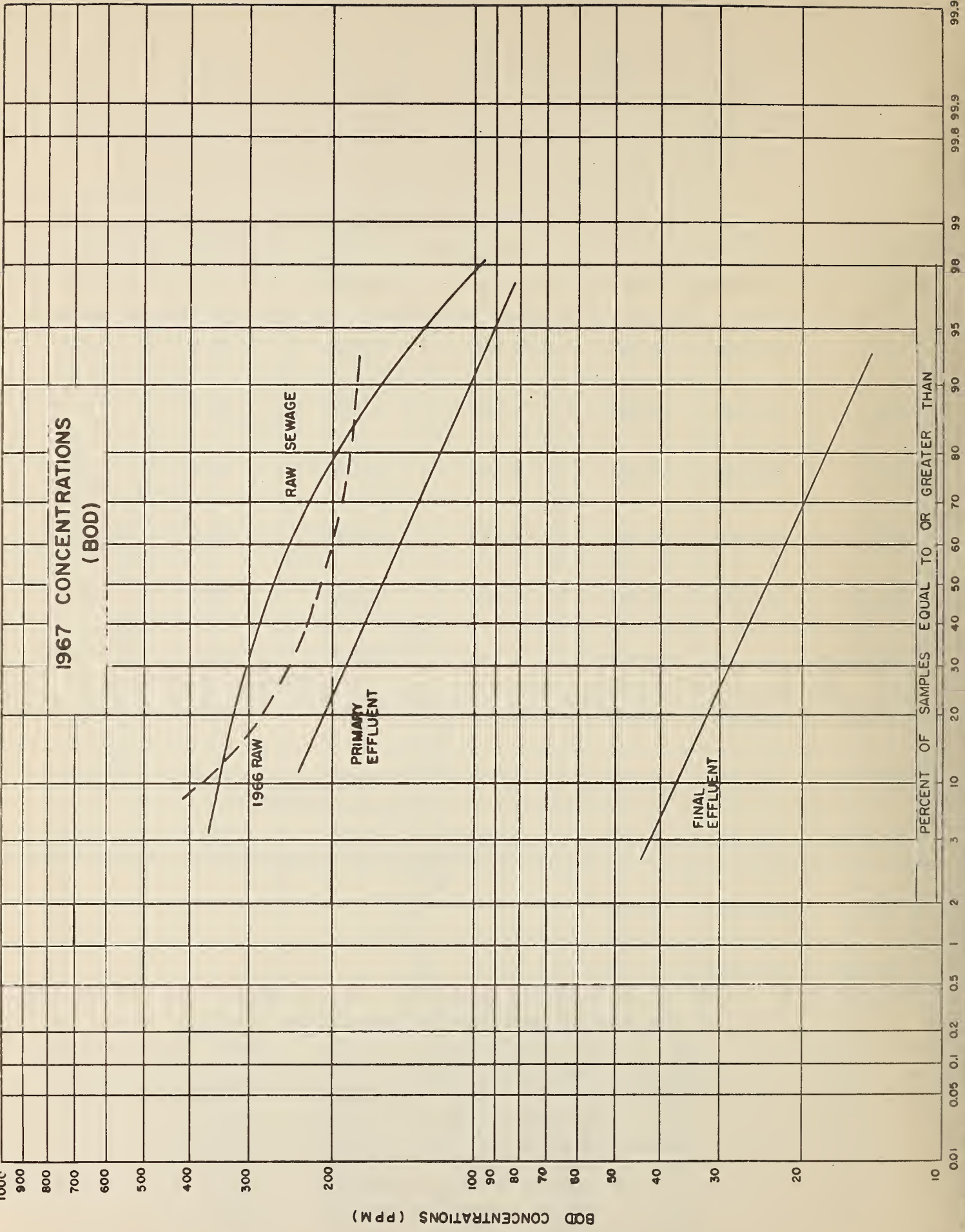


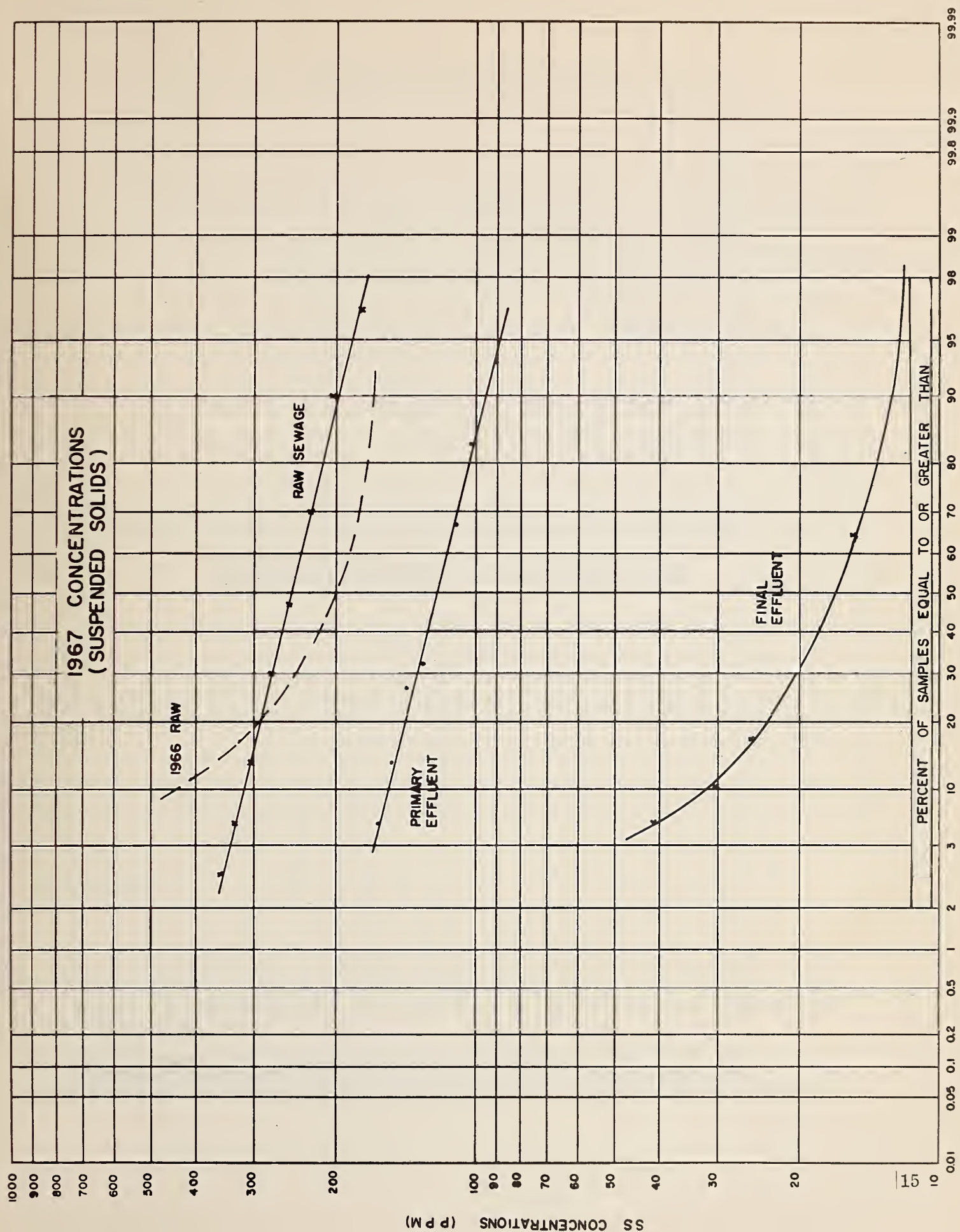
FLOW DATA

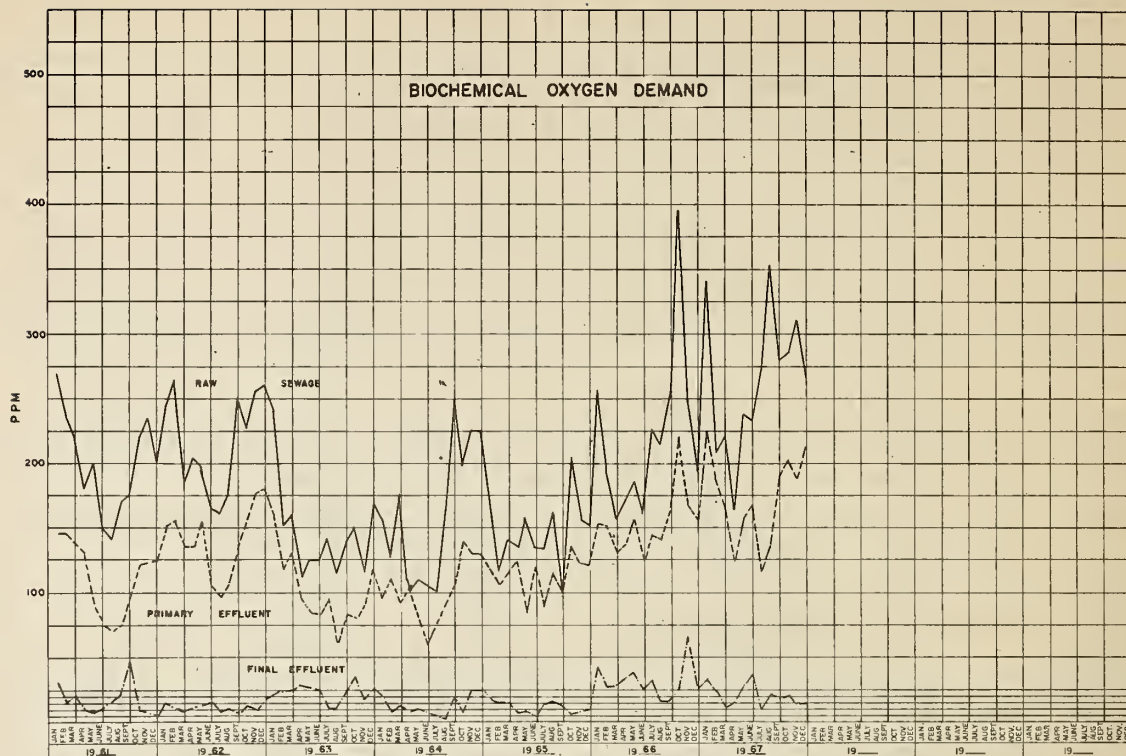
Month	Total Flow (MG)	Avg. Daily Flow (MGD)	Max. Daily Flow (MG)	Min Daily Flow (MG)	Max. Rate (MGD)	Min. Rate (MGD)
January	201.520	6.500	8.080	3.718	12.2	1.7
February	184.980	6.606	7.638	4.318	11.5	2.4
March	212.026	6.840	8.270	4.560	11.5	2.1
April	252.852	8.428	10.939	5.071	15.8	2.9
May	226.257	7.298	8.684	5.422	12.6	2.4
June	223.796	7.460	9.631	5.129	14.8	1.6
July	210.408	6.787	8.170	4.915	16.5	.8
August	197.689	6.377	7.449	4.550	16.5	1.6
September	184.396	6.147	7.518	4.680	16.5	1.0
October	202.514	6.533	7.756	4.790	11.7	1.0
November	209.946	6.998	7.770	5.260	11.0	2.6
December	225.397	7.270	9.940	5.185	18.0	2.4
Total	2621.781	7.183				
Average	218.482					

Year	Total Flow MG	Max. Daily MG	Min. Daily MG	Avg. Daily MG
1960*	1651.0	8.60	3.96	5.39
1961	2287.0	8.05	2.50	6.26
1962	2080.0	7.90	3.26	5.70
1963	2040.0	9.50	2.36	5.59
1964	2221.0	9.78	2.78	6.07
1965	2395.0	11.12	2.74	6.57
1966	2490.0	10.81	3.02	6.82
1967	2621.0	10.94	3.72	7.18

* 10 months' data only







MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	
JAN.	339	32.8	90.3	308.5	289	28.5	90.1	262.5	422
FEB.	207	23.6	88.6	169.6	215	33	84.6	168.3	521
MAR.	221	11.4	94.8	222.2	205	18.5	91.0	197.7	425
APR.	164	15.3	90.7	188.0	165	13.9	91.6	191.1	437
MAY	237	26.8	88.7	237.8	189	11.3	94.0	201.0	381
JUNE	233	35.7	84.7	217.4	272	14.4	94.7	288.2	669
JULY	270	10.1	96.2	273.4	326	9.4	97.1	333.1	632
AUG.	351	21.1	93.8	326.1	204	7.3	96.4	194.4	1112
SEPT.	279	17.9	93.6	240.7	259	5.9	97.7	233.4	467
OCT.	285	19.6	93.1	268.7	234	9.6	95.9	227.2	575
NOV.	309	14.0	95.5	309.7	232	13.6	94.1	229.3	745
DEC.	266	14.0	94.7	284.0	206	13.3	93.5	217.2	770
TOTAL	-	-	-	3314.8	-	-	-	2743.4	7156
AVG.	263	20.2	92.1	276.2	233	14.9	93.3	228.6	596

COMMENTS

Raw sewage in 1967 was organically stronger than 1966. The average BOD was 263 ppm as opposed to a design value of 170 ppm and the 1966 average of 224 ppm. The suspended solids averaged 233 ppm as opposed to a design value of 175 ppm and the 1966 average of 241 ppm.

Effluent quality was improved in 1967 averaging 20.2 ppm BOD and 14.9 ppm suspended solids as opposed to the 1966 averages of 31.4 ppm BOD and 19.2 ppm sus-

pended solids. OWRC objectives for effluent from a secondary treatment plant are 15 ppm for both BOD and suspended solids.

A total of 3314.8 tons of BOD was removed in 1967, which is an increase of 38 percent over 1966. A total of 2743.4 tons of suspended solids was removed in 1967 which is very similar to the removal in 1966.

In conclusion, the solids loading on the plant has not altered appreciably but the organic load, or the load on the biological process section of the plant has increased by 17.4 percent over 1966. The plant effluent has shown steady improvement throughout the year, resulting in an overall average BOD 36 percent lower than the 1966 average and suspended solids 22 percent lower.

TOTAL PLANT REMOVAL

1

TONS BOD
TONS SS

REMOVAL IN TONS PER MONTH

500
400
300
200
100

JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC 19 61
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC 19 62
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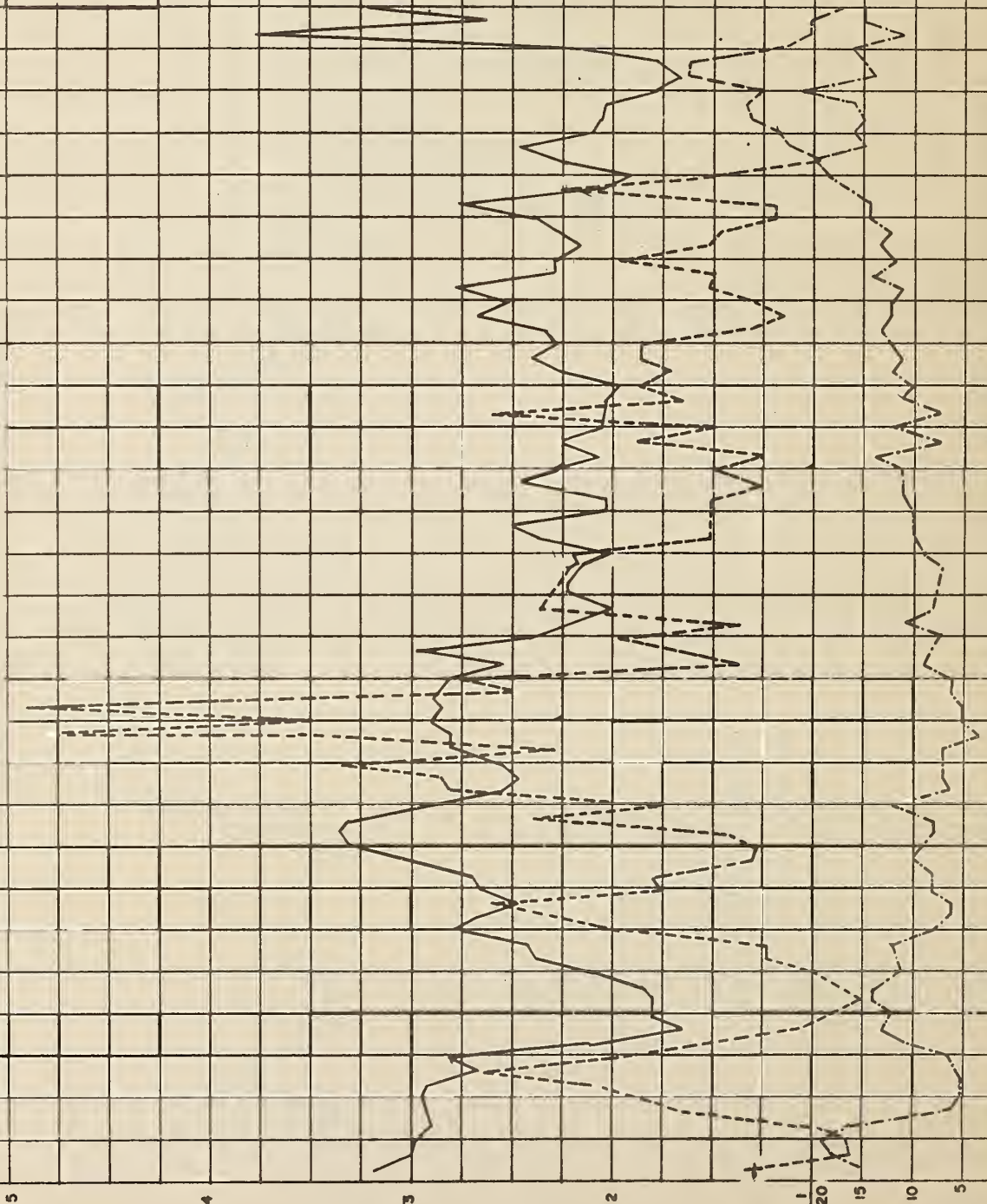
AERATION TANK RESULTS

— MLSS IN PPM $\times 1000$
 - - - CU. FT. OF AIR/LB BOD REMOVED $\times 1000$
 - · - · - LBS. BOD PER 100 LBS MLSS.

AIR AND MLSS

BOD

JAN 1961 FEB 1961 MAR 1961 APR 1961 MAY 1961 JUN 1961 JUL 1961 AUG 1961 SEP 1961 OCT 1961 NOV 1961 DEC 1961
 JAN 1962 FEB 1962 MAR 1962 APR 1962 MAY 1962 JUN 1962 JUL 1962 AUG 1962 SEP 1962 OCT 1962 NOV 1962 DEC 1962
 JAN 1963 FEB 1963 MAR 1963 APR 1963 MAY 1963 JUN 1963 JUL 1963 AUG 1963 SEP 1963 OCT 1963 NOV 1963 DEC 1963
 JAN 1964 FEB 1964 MAR 1964 APR 1964 MAY 1964 JUN 1964 JUL 1964 AUG 1964 SEP 1964 OCT 1964 NOV 1964 DEC 1964
 JAN 1965 FEB 1965 MAR 1965 APR 1965 MAY 1965 JUN 1965 JUL 1965 AUG 1965 SEP 1965 OCT 1965 NOV 1965 DEC 1965
 JAN 1966 FEB 1966 MAR 1966 APR 1966 MAY 1966 JUN 1966 JUL 1966 AUG 1966 SEP 1966 OCT 1966 NOV 1966 DEC 1966
 JAN 1967 FEB 1967 MAR 1967 APR 1967 MAY 1967 JUN 1967 JUL 1967 AUG 1967 SEP 1967 OCT 1967 NOV 1967 DEC 1967
 JAN 1968 FEB 1968 MAR 1968 APR 1968 MAY 1968 JUN 1968 JUL 1968 AUG 1968 SEP 1968 OCT 1968 NOV 1968 DEC 1968
 JAN 1969 FEB 1969 MAR 1969 APR 1969 MAY 1969 JUN 1969 JUL 1969 AUG 1969 SEP 1969 OCT 1969 NOV 1969 DEC 1969



AERATION SECTION

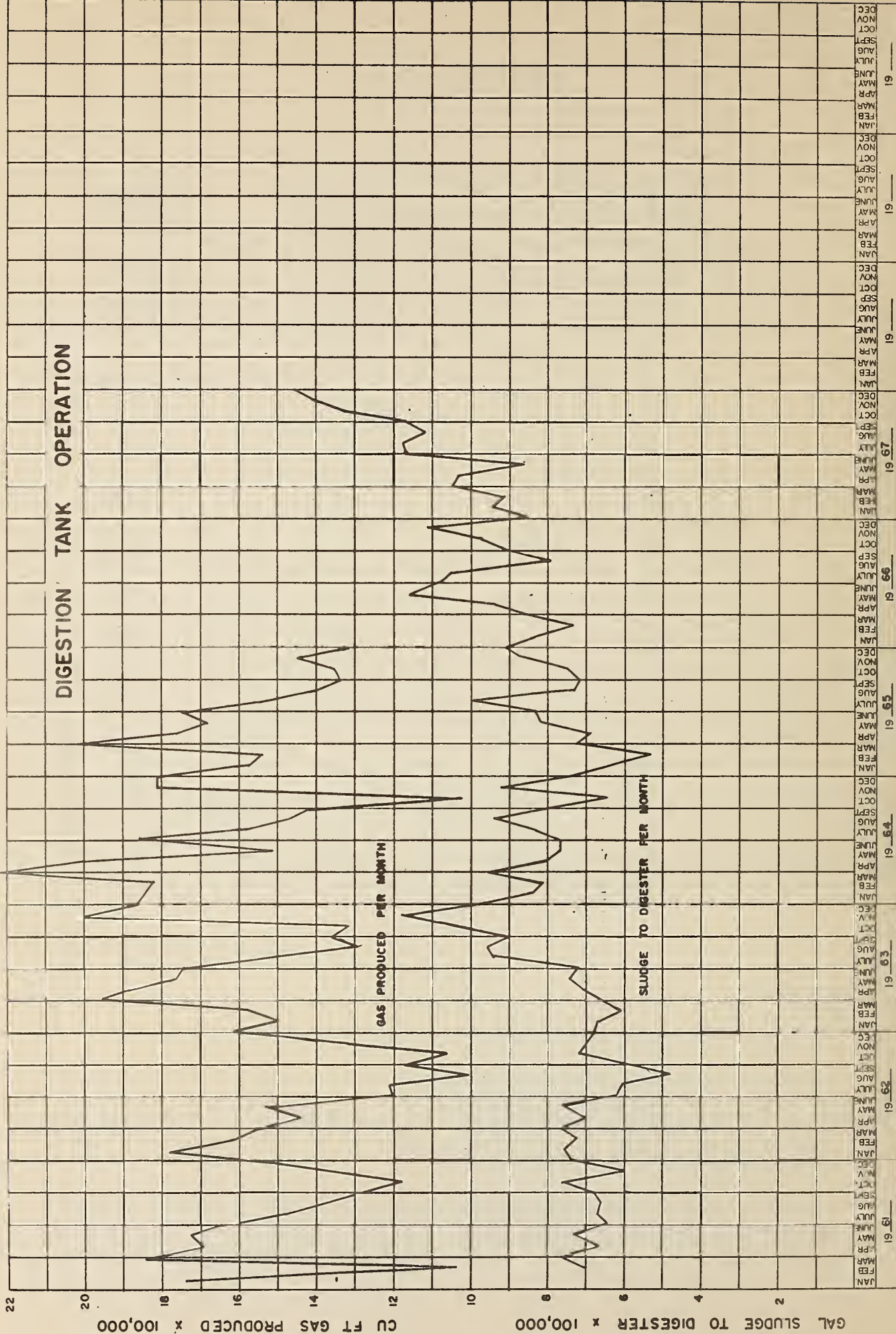
MONTH	PRIM. EFFL B.O.D. PPM.	MLSS. PPM.	LBS BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. BOD. REMOVED
JANUARY	225	2262	20	959
FEBRUARY	188	2476	15	1133
MARCH	166	2109	16	1175
APRIL	121	2060	15	1320
MAY	155	2036	16	1342
JUNE	166	1789	21	1253
JULY	116	1670	14	1645
AUGUST	136	1787	15	1632
SEPTEMBER	189	2174	16	1152
OCTOBER	202	3780	11	1028
NOVEMBER	188	2649	15	1018
DECEMBER	213	3203	15	858
TOTAL	-	-	-	-
AVERAGE	172	2333	16	1210

COMMENTS

The primary clarifier removal efficiency was 34.6 percent for the year.

The mixed liquor suspended solids fluctuated between a high of 3780 to a low of 1670 ppm. The aeration tank loading averaged 16 lbs. BOD per 100 lbs. of MLSS. This is up 2 lbs. from 1966 when the average was 14 lbs. Due to the increased organic loading the cubic feet of air per lb. of BOD removed was again reduced from 1484 in 1966 to 1210 in 1967.

Proctor & Redfern consulting engineers were hired in 1967 to prepare a report on the aeration section and recommend acceptable modifications whereby dissolved oxygen levels in the aeration tanks would be maintained at an acceptable level.



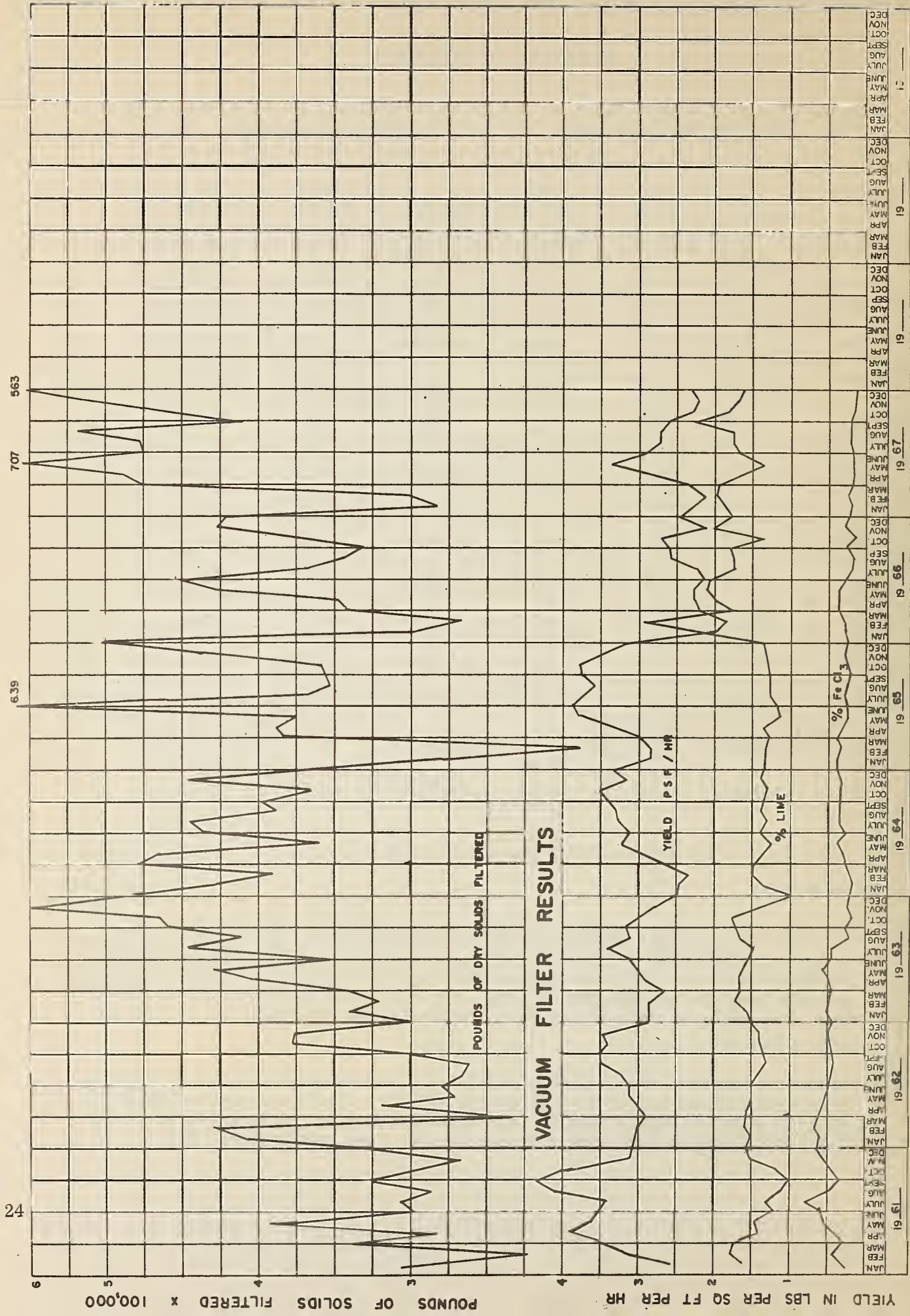
DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS		
	GALLONS	% SOLIDS	% VOL. MAT.	GALLONS	% SOLIDS	% VOL. MAT.
JAN.	943062	5.15	69.7	702718	4.56	66.5
FEB.	910321	5.24	70.4	740357	3.91	56.5
MAR.	1051796	7.03	60.3	1104296	4.33	59.4
APR.	1033640	7.66	57.0	927521	5.34	54.4
MAY	860398	6.25	63.1	1182521	6.00	48.0
JUNE	1164924	5.46	65.9	941960	5.32	56.3
JULY	1177945	5.04	63.0	1010654	4.79	56.6
AUG.	1119030	6.13	59.0	1128519	4.63	53.7
SEPT.	1166970	4.75	64.9	988905	4.48	52.5
OCT.	1323580	4.05	57.9	1157369	3.71	42.0
NOV.	1401460	4.15	67.4	1410642	3.69	58.0
DEC.	1453255	4.61	66.4	1451635	3.94	57.6
TOTAL	13606381	-	-	12747097	-	-
AVG.	1133865	5.46	63.8	1062258	4.55	55.1

COMMENTS

A total of 13,606,381 gallons of raw sludge was pumped to the primary digesters in 1967. This represents an increase of 20 percent over 1966. The average total solids content in the raw sludge was 5.46 percent which is a slight increase over the average 5.30 percent in 1966. The digested sludge from the secondary digesters was up in total volume by 17 percent over 1966, with 12,747,097 gallons withdrawn.

Secondary digested sludge percent solids was slightly increased on the average from 4.26 percent in 1966 to 4.55 percent in 1967. There was approximately 30 percent volatile solids reduction in the digestion process which is similar to that achieved in other years. There was no record of gas production in 1967.



VACUUM FILTER OPERATION

MONTH	% SOLIDS FILTRATE	FILTER HOURS	% SOLIDS SLUDGE	LBS. DRY SOLIDS FILTERED	LBS. CAO	% CAO	LBS. $FeCl_3$ (100%)	% $FeCl_3$	% SOLIDS FILTERED SLUDGE	YIELD PSF/HOUR
JAN.	0.80	352.50	4.05	284374	52780	18.6	5727	2.0	18.5	2.30
FEB.	1.61	393.50	4.12	303925	60550	19.9	6587	2.2	17.8	2.13
MAR.	1.80	569.00	4.35	476443	92680	19.5	9118	1.9	18.9	2.35
APR.	1.40	489.00	5.34	492325	79485	16.1	7949	1.6	20.4	2.88
MAY.	0.98	586.75	6.00	707141	96665	13.7	11808	1.7	20.3	3.40
JUNE	1.40	458.00	5.06	475597	80306	16.9	8924	1.9	20.2	2.92
JULY	1.38	496.25	4.70	478325	83680	17.5	9715	2.0	19.1	2.75
AUG.	1.52	550.50	4.63	520347	90930	17.5	10153	2.0	19.8	2.73
SEPT.	0.85	480.75	4.48	411487	93950	22.8	8281	2.0	20.4	2.61
OCT.	1.55	558.00	3.89	467600	85310	18.3	8158	1.7	18.2	2.30
NOV.	1.43	662.75	3.69	518807	88115	17.0	7229	1.4	16.8	2.24
DEC.	2.04	699.75	3.87	563364	92970	16.5	6532	1.2	16.7	2.30
TOTAL		6296.75		5699735	997421		100161			
AVG.	1.40	524.73	4.52	474978	83118	17.5	8348	1.8	18.9	2.58

COMMENTS

The filters were operated for a total of 6296 hours in 1967 as compared to 5551 hours in 1966 for an increase of 13.4 percent. There was an increase of 29 percent in dry solids filtered in 1967 over the previous year, and the yield rate averaged 2.58 psf/hour, up by 12 percent over 1966.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	201.520	4693	2.5
FEBRUARY	184.980	4962	2.7
MARCH	212.026	3373	1.8
APRIL	252.852	4477	1.8
MAY	226.257	4647	2.1
JUNE	223.796	4614	2.1
JULY	210.408	4501	2.3
AUGUST	197.689	5324	2.9
SEPTEMBER	184.396	4707	2.6
OCTOBER	202.514	4803	2.4
NOVEMBER	209.946	4877	2.3
DECEMBER	225.397	5027	2.2
TOTAL	2621.781	56005	-
AVERAGE	218.482	4667	2.3

COMMENTS

Chlorine is added to the final effluent for disinfection on a year-round basis. An average chlorine dosage of 2.3 ppm was required to maintain a residual of 0.5 ppm after 15 minutes.

RECOMMENDATIONS

Subject to approval by the municipality and the Ontario Water Resources Commission, a new agreement should be initiated in 1968 to cover the cost of modifications to the aeration equipment and the return sludge facilities.

Secondary digesters are to be emptied and supernatant withdrawal equipment repaired. A determined effort will be made to improve the concentration of solids in the secondary digested sludge with a resulting improvement in vacuum filter efficiency.

Deterioration of the brick work on the primary and secondary digesters is severe. Action on reclamation or replacement should be initiated in 1968.

TD227/B73/W37/1967/MOE
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MINISTRY OF THE ENVIRONMENT

